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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/631,260	07/31/2003	Thomas A. Taylor	CS-21318	1591

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PRAXAIR, INC.  
LAW DEPT - MI557  
39 OLD RIDGEBURY ROAD  
DANBURY, CT 06810-5113

EXAMINER

BAREFORD, KATHERINE A

ART UNIT	PAPER NUMBER
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1762

DATE MAILED: 10/22/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/631,260

Applicant(s)

TAYLOR ET AL.

Examiner

Katherine A. Bareford

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-35 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-35 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 July 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 7/03.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_.

## DETAILED ACTION

### *Drawings*

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the thermal spray device and gas shield device of claims 33-35 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### *Claim Objections*

2. Claims 33 and 35 are objected to because of the following informalities: (1) In claim 33, line 1 provides a "thermal gas shield device", line 2 refers to "effluent of the device" and lines 3-4 refer to "said thermal spray device". Apparently claim 1 should be a "thermal spray device with a gas shield" to provide correct antecedent basis for the various devices. (2) in claim 35, lines 8-9, "the plasma spray device" lacks antecedent basis, as previously only a "thermal spray device" was referred to in the claim.

Appropriate correction is required.

### *Claim Rejections - 35 USC § 102*

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 3, 4, 7, 15, 16, 18-21, 30 and 33-34 are rejected under 35 U.S.C. 102(b) as being anticipated by Rotolico et al (US 4964568).

Rotolico teaches a method and apparatus for shielding the effluent of a thermal spray device. Column 2, lines 35-50 and column 9, lines 1-15. An annular source of shield gas is provided. Figure 2, column 2, lines 40-50, column 6, lines 50-68, and column 8, line 65 through column 9, line 15. The shield gas is heated to a temperature above ambient. Column 8, line 30 through column 9, line 15 (the combustion gas envelope 174, the second combustion flow, for example, shields the center flow and is heated by the combustion). The shield gas flow is

substantially surrounding the effluent in a coaxial manner. Figure 2 and column 8, line 30 through column 9, line 15. The annular source of the shield gas is in a plane normal to the effluent flow, thereby providing gas flow parallel to the effluent. Figure 2 and column 8, line 30 through column 9, line 15.

Claim 3: the shield gas is a combustible gas comprising a combustion flame and combustion products. Column 8, line 30 through column 9, line 15 (the combustion gas envelope 174, the second combustion flow, for example, shields the center flow and is heated by the combustion).

Claim 4: the shield gas is a flow having at least a laminar segment from the source of the effluent flow. Column 2, lines 35-68 and figure 2 (the first inner inert gas surrounds the effluent).

Claim 7: the effluent is deposited onto a substrate to form a coating layer. Column 9, lines 15-45.

Claim 15: the substrate can be a gas turbine component. Column 13, lines 55-60.

Claim 16: the annular source comprises a first inner coaxial section for the flow of a first gas substantially surrounding the effluent and a second coaxial outer section for the flow of a second gas surrounding the inner flow of the first gas. Column 2, lines 35-50, column 8, line 30 through column 9, line 15 and figure 2. The second flow is heated to a temperature above ambient. Column 8, line 30 through column 9, line 15 (the combustion gas envelope 174, the second combustion flow, for example, shields the center flow and is heated by the combustion).

The annular sources of the shield gases are in a plane normal to the effluent, thereby providing the gas flows parallel to the effluent. Figure 2 and column 8, line 30 through column 9, line 15.

Claim 18: the first gas is an inert gas. Column 2, lines 35-50.

Claim 19: the second gas is a combustible gas comprising a combustion flame and combustion products. Column 2, lines 35-50 and column 8, line 30 through column 9, line 15 (the combustion gas envelope 174, the second combustion flow, for example, shields the center flow and is heated by the combustion).

Claim 20: the effluent is a reactive material. Column 2, lines 35-45 (the spray material can oxidize).

Claim 21: the effluent is deposited on the substrate to form a coating layer. Column 9, lines 15-45.

Claim 30: the substrate can be a gas turbine component. Column 13, lines 55-60.

Claim 33: a thermal gas shield device is provided having an exit end adapted for the effluent of the device comprising a ring of nozzles surrounding the exit end of the thermal spray device. Figure 2 and column 2, line 50 through column 3, line 10. Each of the nozzles has an orifice defined by a closed wall with a straight section disposed immediately preceding the exit end of the device adapted for directing at least a laminar segment of a shield gas from the exit end. Figure 2 and column 2, line 50 through column 3, line 10 and column 8, line 30 through column 9, line 15. The shield gas is adapted for coaxially surrounding the effluent. Figure 2 and column 2, line 50 through column 3, line 10.

Claim 34: the ring of nozzles comprises at least two spaced apart coaxially disposed rings of nozzles. Figure 2 and column 2, line 50 through column 3, line 10 and column 8, line 30 through column 9, line 15.

*Claim Rejections - 35 USC § 103*

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

11-14 26-29  
7. Claims 2, 11, 17, and 31-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rotolico et al (US 4964568).

Rotolico teaches all the features of these claims, as discussed in the 35 USC 102(b) rejection above, except (1) the temperature of the gas (Claim 2, 17) and (2) the control of the temperature of the substrate using gas temperature and powder (claims 11-14 and 26-29), and (3) the carbon:oxygen ratio in the shield gas (claim 31-32).

However, Rotolico teaches that the combustion gases can be provided with a primary fuel of different materials and amounts, such as propylene and hydrogen, which reacts with oxygen. Column 8, lines 45-65. Flow rates for the combustion gas envelope can also vary. Column 9, lines 1-15. Rotolico also teaches desired flow rates of the different gases. Column 9, lines 1-15 and 35-45.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Rotolico to optimize the spraying temperatures of the gases and the carbon:oxygen ratio in the shield gas through routine experimentation, because Rotolico teaches that varying amounts of materials and flow rates can be provided for the combustion gases for the shield gas, which would provide varying spray temperatures and carbon:oxygen ratios. The specific amounts and flow rates to be used for a specific coating would thus have to be optimized from the available ranges. Furthermore, the temperature of the substrate would be, in turn, affected by the temperature of the gases as the gases impacted the substrate during spraying, thus the temperature of the substrate would be controlled by the temperature/power of the gases. The ratios of gas flows would be suggested by Rotolico, given that the amounts taught. This would also provide a comparative power ratio.

8. Claims 5 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rotolico as applied to claims 1, 3, 4, 7, 15, 16, 18-21, 30 and 33-34 above, and further in view of Nowotarski et al (US 5486383).



Rotolico teaches all the features of these claims except (1) the oxide spray (claim 5) and (2) the use of a plasma spray device (claim 35).

However, Nowotarski teaches that when spraying with a flame spraying or plasma spray devices, it is desirable to shield the spray. Column 3, lines 20-45 and column 3, line 60 through column 4, line 40. Nowotarski teaches that it is desirable to heat the shield gas to prevent undesirable oxygen intrusion from the outside air. Column 7, lines 20-60. Nowotarski teaches that the device can be used to spray metals or oxides. Column 3, lines 55-65.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Rotolico to use the multiple shielding gases for plasma as well as flame spraying as suggested by Nowotarski to provide a desirable shielded spray for different spray devices, because Rotolico teaches a three layer gas envelope with heated combustion gas that protects a flame sprayed material and Nowotarski teaches that it is desirable to provide a heated shielding gas layer for both flame and plasma spraying. Similarly Nowotarski teaches the desire~~d~~ to spray metals or oxides with thermal spraying equipment.

9. Claims 6, 8-10 and 22-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rotolico in view of Nowotarski as applied to claims 5 and 35 above, and further in view of Taylor (US 5073433).

Rotolico in view of Nowotarski teaches or suggests all the features of these claims, including the shielded spraying of oxides or metals from plasma or flame spray systems, except (1)

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the layer material (claim 6, 24), (2) the cracks (claim 8, 10, 25), and (3) the multiple layers (claim 9, 22, 23).

However, Taylor teaches a desirable coating system for gas turbine engine parts. Column 2, lines 35-45. The coating can include a bond coat layer applied by plasma spraying. Column 4, lines 45-60. The bond coat can be an alloy of Ni, Co or Fe with Cr, Al and Y. Column 4, lines 45-60. Then a thermal barrier layer is applied. Column 4, lines 40-55. The thermal barrier layer can be yttria stabilized zirconia. Column 2, lines 35-45. The thermal barrier layer can be applied by plasma spraying. Column 3, lines 40-50. The thermal barrier layer desirably has 20-200 vertical cracks per linear inch. Column 2, lines 45-50.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Rotolico in view of Nowotarski to use the system to spray multiple layer thermal barrier coatings as suggested by Taylor to provide a desirable thermal barrier <sup>coating</sup> ~~coating~~, because Rotolico in view of Nowotarski teaches desirable shielded spraying of oxides or metals from plasma or flame spray systems and Taylor teaches that plasma spraying can desirably be used to provide a multiple layer thermal barrier system of a metal bond coating and zirconia top coat, with the top coat containing 20-200 cracks (segments) per linear inch.

### *Conclusion*


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Katherine A. Bareford whose telephone number is (571) 272-1413. The examiner can normally be reached on M-F(6:30-4:00) with the First Friday Off.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive P. Beck can be reached on (571) 272-1415. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and for After Final communications.

Other inquiries can be directed to the Tech Center 1700 telephone number at (571) 272-1700.

Furthermore, information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
KATHERINE BAREFORD  
PRIMARY EXAMINER